

Northumbria Research Link

Citation: Edmond, Gary (2020) Fingerprint evidence in New Zealand's courts: The oversight of overstatement. *New Zealand Universities Law Review*, 29 (1). pp. 1-29. ISSN 0549-0618

Published by: Thomson Reuters

URL: <http://www.nzulr.com/default.htm> <<http://www.nzulr.com/default.htm>>

This version was downloaded from Northumbria Research Link:
<http://nrl.northumbria.ac.uk/id/eprint/43329/>

Northumbria University has developed Northumbria Research Link (NRL) to enable users to access the University's research output. Copyright © and moral rights for items on NRL are retained by the individual author(s) and/or other copyright owners. Single copies of full items can be reproduced, displayed or performed, and given to third parties in any format or medium for personal research or study, educational, or not-for-profit purposes without prior permission or charge, provided the authors, title and full bibliographic details are given, as well as a hyperlink and/or URL to the original metadata page. The content must not be changed in any way. Full items must not be sold commercially in any format or medium without formal permission of the copyright holder. The full policy is available online: <http://nrl.northumbria.ac.uk/policies.html>

This document may differ from the final, published version of the research and has been made available online in accordance with publisher policies. To read and/or cite from the published version of the research, please visit the publisher's website (a subscription may be required.)



**Northumbria
University**
NEWCASTLE



UniversityLibrary

Fingerprint evidence in New Zealand's courts: The oversight of overstatement

Gary Edmond[†]

Abstract

This article documents the persistent mis-representation and mis-understanding of the most ubiquitous forensic science of the past century. That is, the treatment of latent fingerprint evidence as categorical identification of a specific person. Following a review of the manner in which latent fingerprint evidence was presented in trials and appeals, starting at the beginning of the twentieth century and continuing until the present, it introduces scientific research and advice. This juxtaposition allows us to observe how New Zealand's legal institutions have not required fingerprint examiners to temper their claims in response to mainstream scientific research and advice (emerging largely out of the US and UK). In conclusion, drawing upon scientific recommendations, the article explains what is required to make the claims of latent fingerprint examiners scientifically grounded such that their probative opinions can be evaluated in ways that facilitate the goals of rectitude and fairness.

1. INTRODUCTION

From the first occasion when fingerprint evidence was reported in a judgment until the present day, New Zealand's fingerprint examiners have presented their opinions as categorical evidence of identification.¹ They equated decisions about two prints matching with the identification of a specific person without qualification or caveat. On the rare occasion when the accuracy of an opinion was questioned examiners invoked the uniqueness of fingerprints and the infallibility of their 'method', sometimes in conjunction with training and experience, to support error-free performance. Today, fingerprint examiners continue to identify latent prints in categorical terms.² Trial and appellate courts continue to admit and endorse these categorical claims. When fingerprint evidence is adduced courts frequently expect defendants to provide an explanation for *their* presence or *their* touch. Drawing upon scientific research and advice, this article questions these conventional approaches. It explains how equating a match decision with categorical identification overstates the value of opinions in ways that appear inconsistent with actual abilities as well as fundamentals of the accusatorial trial.

This article examines judicial decisions. While it does not purport to capture all of the nuances of the more detailed challenges and qualifications encountered in criminal proceedings across the previous 120 years, it does document how lawyers and courts represented and understood latent fingerprint evidence.³ There are few, if any, decisions that modify or qualify the reception of fingerprint evidence as categorical identification.⁴

[†] Professor, School of Law, UNSW; Research Professor (fractional), School of Law, Northumbria University; Chair, Evidence-based Forensics Initiative. Thanks to Andrew Ligertwood, Julia Tolmie, Elizabeth McDonald, David Hamer and Emma Cunliffe.

¹ The terms categorical identification, positive identification and individualisation are used synonymously. They all imply that the decision about two fingerprints matching represents the identification of a specific person.

² Technically, latent prints are prints produced by friction ridge skin (from the fingers, palm and feet) that are deposited on a thing and are not readily visible to the naked eye. These are often exposed through the use of powders and other methods involving chemicals and lighting. The term 'latent print' conventionally includes all crime scene prints and this includes those that are visible, such as fingermarks in blood.

³ An account of challenges in New Zealand courts is the subject of a separate article: 'Fingerprint evidence in New Zealand's courts: A history of legal challenges' (2020) *New Zealand Universities Law Review* (forthcoming).

⁴ Examiners occasionally report and even testify that no prints were recovered, that the recovered prints were insufficient for comparison, or that the defendant could not be excluded. This article is concerned with the more familiar use of fingerprints as positive evidence of identity.

There does not seem to be a single instance of a lawyer or a judge describing fingerprint evidence in a way that is consistent with relevant scientific research and advice.⁵

The following account begins with an examination of the treatment of latent fingerprint evidence in the first reported decisions, where New Zealand's judges lent their institutional imprimatur in remarkably strong terms. Section 3 reviews the way latent fingerprint evidence was subsequently presented and understood as unequivocal evidence of identity across the twentieth and twenty-first centuries. Section 4 illustrates how even the most elaborate challenges to the accuracy of latent fingerprint evidence did not lead courts to re-consider their conventional commitments. Then, turning to scientific research and mainstream scientific interventions, Section 5 confronts the reader with contemporary scientific perspectives on latent fingerprint comparison, including the results of the first validation studies *beginning in 2009*. As we shall see, reviews by pre-eminent scientific organisations present latent fingerprint comparison in ways that are irreconcilable with its presentation in New Zealand's courtrooms and case law. Drawing on this scientific research and derivative recommendations, the article closes with advice on how fingerprint evidence should be presented in reports and testimony, and what courts should require before the opinions of latent fingerprint examiners are admitted in criminal proceedings.

This account reveals a century of overstatement and misunderstanding under the oversight of prosecutors and judges.⁶ Inexorably, it implicates legal institutions.⁷ For, admission and reliance made substantial contributions to the socio-legal status of fingerprint evidence as practically infallible evidence of identity. Lawyers, judges and courts conferred legitimacy but without meaningful epistemological engagement. They never asked: *Can you do it, how well, and how do we know?*⁸

2. EARLY REPORTS OF FINGERPRINT EVIDENCE

There are many references to fingerprint evidence in New Zealand courts following its introduction in the first decade of the twentieth century.⁹ This section reviews the first three reported cases – *Rex v Clancy*, *Rex v Krausch* and *The King v Gunn*.¹⁰

The first 'report' of fingerprint evidence appears in *Rex v Clancy* in 1905.¹¹ Clancy was indicted for breaking, entering and theft before Chief Justice Stout in Wellington.

⁵ This is largely consistent with practices in other common law jurisdictions. For Australia, see Gary Edmond, 'Latent science: A history of challenges to fingerprint evidence in Australia' (2019) 38 *University of Queensland Law Journal* 301, and for England and Wales, consider Gary Edmond, Emma Cunliffe and David Hamer, 'Fingerprint comparison and adversarialism: The scientific and historical evidence' (2020) 83 *Modern Law Review* (forthcoming).

⁶ Though, note Susan Glazebrook, 'Miscarriage by expert' (2018) 49 *Victoria University Wellington Law Review* 245 and in Australia, Chris Maxwell, 'Preventing Miscarriages of Justice: The Reliability of Forensic Evidence and the Role of the Trial Judge as Gatekeeper' (2019) 93 *Australian Law Journal* 642.

⁷ This might be characterised as legal 'worldmaking' or 'co-production', see Nelson Goodman, *Ways of Worldmaking* (Indianapolis, Hackett, 1978) and Sheila Jasanoff (ed.), *States of knowledge: The coproduction of science and social order* (London, Routledge, 2004).

⁸ See Kristy Martire and Gary Edmond, 'Rethinking Expert Opinion Evidence' (2017) 41 *Melbourne University Law Review* 967.

⁹ Trials were often reported in contemporary newspapers, available at <<https://paperspast.natlib.govt.nz/newspapers>>. On the history of latent fingerprint comparison, more generally, see Simon Cole, *Suspect Identities: A History of Fingerprinting and Criminal Identification* (Cambridge, MA, Harvard University Press, 2001); Chandak Seengoopta, *Imprint of the Raj: How Fingerprinting was Born in Colonial India* (London, PanMacMillan, 2003); Colin Beavan, *Fingerprints: The Origins of Crime Detection and the Murder Case that Launched Forensic Science* (London, Hyperion, 2001).

¹⁰ *Rex v Clancy*, Circular No 15, 1905; *Rex v Krausch* (1913) 32 NZLR 1229; *R v Gunn* - Jury Instructions re fingerprint evidence [1920] NZPoliceLawRp 1; (1920) 2 New Zealand Police Law Reports (Supplement) i (28 May 1920).

¹¹ *Rex v Clancy*, Circular No 15, 1905. Reproduced in the *Police Law Reports* as an appendix to *Gunn*.

The Crown relied on fingerprint evidence recovered from a broken window. Newspapers reported *Clancy* as the first fingerprint-only prosecution.¹² The short report of the case explains:

At the Supreme Court the Finger-print Branch experts proved positively that the print on the glass was identical with that of Clancy's third right finger, and must have been made by him. Lengthy cross-examination failed to shake that evidence in the slightest degree.

On this evidence alone prisoner was found guilty and sentenced to three years' imprisonment with hard labour.¹³

A fingerprint recovered from the outside of a window is identified to Clancy without qualification – the latent print 'must have been made by him.' The evidence was admitted and Clancy was convicted.¹⁴ The trial is implicitly fair, the evidence reliable and the verdict sound, because the defendant is legally represented and cross-examination could not 'shake' the fingerprint evidence 'in the slightest degree'.

The next legal report of fingerprint evidence arises out of *Rex v Krausch*.¹⁵ The *New Zealand Law Reports* reproduce Justice Chapman's charge to the jury in a prosecution again concerned with breaking and entering. Along with the fingerprint examiner's opinion, that Krausch was the offender based on 'fifteen points of resemblance', the jury was presented with 'enlarged photographs' of the prints and invited to make its own comparison.¹⁶

In his address, Chapman J assured the jury about the scientific foundations of the fingerprint evidence:

So many of these cases have now been tried in this Court, and reference has so often been made to *expert testimony and books of authority* on this subject, that *the leading facts of it may well be taken to be established scientific facts*. Under the law of this country a Judge may in *scientific matters* refer to such books as he may consider to be of authority on the subjects to which they relate. I have referred so often to these matters that I now know *what the books have to say* on the subject, just as most of us know the main facts about a limited number of poisonous substances and other facts which formerly had to be proved by expert witness. The *leading facts* respecting finger-markings such as have been proved in this case may be regarded as *established biological facts*.¹⁷

There are many references to 'facts' and extensive legal use, but no actual references to scientific materials.¹⁸ All this seems intended to reinforce the extreme improbability of finding matching prints from a source other than the defendant.

Defence counsel's attempt to introduce 'authority' from Australia, namely the dissent of the Chief Justice of Victoria in *R v Parker* (1912), stimulated a critical rejoinder.¹⁹

¹² Upon committal, the *Waikato Times* reported the 'experts' locating 21 points of similarity between the prints and declaiming that 'the chances against the marks on the glass having been made by any other finger than Clancy's are over two thousand billion to one.' See 'The finger print system', *Waikato Times*, 7 March 1905; 'Traced by a finger print. An interesting case', *Manawatu Times*, 7 March 1905. On quantification, see Francis Galton, *Fingerprints* (London, MacMillan & Co, 1892).

¹³ *Supplement to Police Reports*, 1920, 11.

¹⁴ There is no reference to any legislative scheme for the collection of samples.

¹⁵ *Rex v Krausch* (1913) 32 NZLR 1229.

¹⁶ *Krausch*, 1230. Fingerprint evidence may have helped to reduce forms of racial discrimination in some investigations: see also *R v Blacker* [1910] SR (NSW) 357.

¹⁷ *Krausch*, 1230. (italics added)

¹⁸ *Krausch*, 1231. Notwithstanding the fingerprint examiner's categorical identification, the judge introduces the language of 'odds' and embarks on a series of probabilistic analogies. The analogies are reminiscent of *People v Collins* 68 Cal. 2d 319 (1968); see Lawrence Tribe, 'Trial by mathematics' (1971) 84 *Harvard Law Review* 1329.

¹⁹ *R v Parker* [1912] VR 152. See Edmond, 'Latent science'; Jeremy Gans, 'A Tale of Two High Court Forensic Cases' (2011) 33 *Sydney Law Review* 515.

Against Madden CJ's questioning of the value of untested opinion, Chapman J counterposes the collective experience of the New Zealand judiciary:

... all of the Judges of this Court who have had anything to do with cases in which this class of evidence has been brought forward have emphatically expressed opinions at variance with that of that eminent Judge.²⁰

The approach from *Krausch* was followed in *The King v Gunn*. Gunn was on trial for murder, again before Chapman J, in the first capital case dependent on fingerprint evidence. The Post Master had been shot dead and his keys were taken to obtain access to the post office. The main evidence was identification by latent fingerprints recovered from the post office's cash boxes and a revolver – see Figure 1.²¹



THE CLINCHING PROOFS OF CRIMINAL GUILT.—FINGER PRINTS OF DENNIS GUNN, THE PONSONBY MURDERER

The conviction of Dennis Gunn as the murderer of Mr Braithwaite, the postmaster at Ponsonby, Auckland, is held to be a complete vindication of the value of finger-print evidence. Prints were found on a cashbox at the Post Office where the crime was committed, and also on a revolver found near Gunn's home. The print on the left is a reproduction of that which was found on the cashbox; that on the right is the official print taken after Gunn's arrest. There were forty points of identification when the two were compared.²²

Figure 1: One of the fingerprints used to identify Gunn.

Justice Chapman's 'address to the jury' was again published, this time in the *Police Law Reports*. Characterising his role as offering 'assistance', Chapman J explained:²³

The Crown claims that the police have found in the building itself, on the cash-boxes, *unmistakable* evidence left there by the accused, *as certain in their effect as if he had left his signature*. That is the case for the Crown, and that is the case you are asked to act upon. I need hardly point out to you that if that is made out to your satisfaction, then you are offered a stronger case than in many instances has been deemed to be sufficient. The case for the Crown presented to you by finger-print evidence

²⁰ *Gazette Law Report*, 665.

²¹ *Gunn*, x.

²² 'The clinching proofs of criminal guilt', *Free Lance*, Volume XIX, Issue 1043, 23 June 1920; 'The Evidence That Convicted Dennis Gunn', *Observer*, Volume XI, Issue 40, 5 June 1920. Available at: <https://nzhistory.govt.nz/page/fingerprintsconvictmurderer>.

²³ *Gunn*, ii.

is that the marks of identification on prints—of which, at any rate, three are identified—are so numerous and so strong, and their general character and value is so great, that one inference only is left ... *It is for you to test the validity of that argument.*²⁴

The relatively greater evidentiary value of multiple fingerprints is an important issue that is often inadequately addressed (see Section 5.C), perhaps because of pervasive beliefs about the ability to achieve error-free (or ‘unmistakable’) identification based on a single latent print.²⁵

As for defence ‘challenges’ to the fingerprint evidence:

*Counsel for the defence complains that that is expert evidence, and that the prisoner has no evidence to contradict it. So far as we know the history of finger-printing, that complaint might have been made at any time during these seventeen years. In my very long experience on this Bench no one has hitherto produced a conflict of evidence on the subject. So far as the witnesses are able to inform you of the history of the last seventeen years, and so far as the views of other Judges are concerned, no conflict of evidence has ever been heard of.*²⁶

Bizarre to modern eyes, the defence complaint draws attention to the state’s monopoly on fingerprint comparison and the apparent inability to challenge this definitive evidence. It drew a response from the prosecutor that was embraced and reiterated by Chapman J: ‘you might as well try to produce a conflict about the multiplication table’.²⁷ Assumptions about the uniqueness and permanence of friction ridge skin are presented as undisputed ‘biological facts’ and the failure to raise ‘a conflict of evidence on the subject’ is used to confirm the reliability of the fingerprint evidence.²⁸

Clancy, Krausch and Gunn exemplify an emerging course that was not merely replicated but expanded across the ensuing century. Early judicial recourse to ‘the law of probabilities’ was quickly replaced by the less qualified language of categorical identification already employed by fingerprint examiners and prosecutors.²⁹ Explanations, or the perceived need for explanations and reference to scientific support, similarly dropped away.³⁰ These reports may not be the first uses or decisions, but they are the most prominent among the early cases.³¹ They provide the legal authority, and implicitly the epistemological warrant, for relying on fingerprints (alone) as definitive proof of identity and guilt. Following conviction, Gunn was executed.

3. REPRESENTING LATENT FINGERPRINT EVIDENCE AFTER GUNN

The extracts reproduced in this section, taken from decisions in the years following *Gunn*, are selected to illustrate the way latent fingerprint evidence was and continues to be presented and understood as unequivocal evidence of identity. Spanning the decades from the 1920s until the present day, they reveal match decisions being routinely equated, without qualification or explanation, with the identification of a specific person.

²⁴ *Gunn*, iv-vi (italics added). See references to *R v Castleton* [1909] 3 Cr App R 74; *R v Parker* [1912] VR 152; and *People v Jennings*, 252 Ill 534, 96 NE 1077 (1911).

²⁵ *Gunn*, vii. Less is made of the multiple prints than might have been. In *Gunn*, the fact that multiple prints were matched to one of a small pool of (usual) suspects reduces the risk of error. Though, the reason for selecting the prints to compare may be an issue, especially if the examiner knows about the case, the identity of the suspect, or reasons for the selection. See Section 5.C.

²⁶ *Gunn*, v-vi (italics added).

²⁷ *Gunn*, vi.

²⁸ *Gunn*, vi. See also Figure 1, where conviction is characterised as ‘a complete vindication of the value of finger-print evidence.’

^{29,29} See also *Gunn*, vi-vii, ix.

³⁰ Challenges would eventually be satisfied by reference to point standards and ACE-V – see Sections 4.A and 4.B.

³¹ *Krausch* was considered favourably in New South Wales in *R v Tang* (2006) 65 NSWLR 681, [143].

Consider these examples:

... his finger prints had been found on the safe.³²

... he ran off leaving behind an identifiable fingerprint.³³

A number of indistinct prints were found on the door and an identifiable print which turned out to be that of the appellant.³⁴

The imitation gun was wrapped in a black plastic bag, on which Manapouri's palm print was found ... Tulafono's fingerprint was located on ...³⁵

Mr M's fingerprints appear in a number of places on the black polythene bags which surrounded the deceased's body when it was recovered.³⁶

... a fingerprint, established to be that of Mr Gugich, was located in the Essex Street premises ...³⁷

Fingerprints from the respondent's right thumb and left little finger were found on an opened box of cartridges at the address.³⁸

Mr Toman was not the occupant of the Wainuiomata premises but his fingerprint was found on a sheet of foil in a rubbish tin at that address.³⁹

A police fingerprint expert gave evidence to the effect that a fingerprint identified as having come from the respondent, was found on a packet of cigarettes located on the floor inside the premises behind the counter.⁴⁰

A fingerprint lifted from the laptop screen was later identified as Mr Cheng's.⁴¹

³² *The Queen v Samuels* [1962] NZLR 1036, 1037. See also *Mohi v R* [2019] NZCA 441, [8]; *Vaitohi v R* [2019] NZCA 371, [3]; *Woodmass v Police* [2019] NZHC 2503, [9]; *Nelson v Police* [2019] NZHC 2434, [13]; *Police v CW* [2019] NZYC 85, [23]; *Sparks v Police* [2018] NZCA 530, [6]; *Kahia v Police* [2017] NZHC 2018, [12]; *Parata v Police* [2018] NZHC 3234, [4]; *The Queen v Stokes* [2018] NZDC 3880, [29]; *R v Alsford* [2017] 1 NZLR 710, [10]; *Preston v R* [2017] 2 NZLR 358, [12]; *Hardy v The Queen* [2017] NZCA 327, [7], see also [8]; *Simon v R* [2017] NZHC 1235, [4]; *Reti v The Queen* [2016] NZCA 447, [20]; *Bouavong v R* [2014] 2 NZLR 23, [7]; *Gladwin v The Queen* [2014] NZCA 165, [13], [23]; *Wells v The Queen* [2014] NZCA 479, [21]; *Nieuwenhuijsen v The Queen* [2013] NZCA 207, [22]; *Brown v The Queen* [2012] NZCA 457, [12], [40], [41]; *Herangi v Police* [2012] NZHC 1665, [14]; *Britz v The Queen* (CA161/2012, 1 Jan 2012), [6], [107]; *Fulop v The Queen* [2011] NZCA 499, [5]; *Police v SPT* (Youth Court, CRI2011270000062, 9 May 2011), [2]-[3]; *Police v SJ* (NZYC, CRI2010270000183, 22 Feb 2011), [13]; *T v New Zealand Police* (NZHC, CRI 200947027, 30 Sept 2009), [3]-[4]; *T v New Zealand Police* (NZHC, CRI 200947027, 30 Sept 2009), [3]-[4]; *The Queen v May* [2008] NZCA 221, [2]; *Nairn v The Queen* [2008] NZCA 553, [4], [9]; *Barton v Police* [2008] BCL 848, [10], [47]; *R v Reti* [2008] NZHC 794 (29 May 2008), [13]; *Brown v New Zealand Police* (High Court, CRI 2006404000368, 26 Feb 2007, Keane J), [4]; *The Queen v Wheatley* (NZHC, CRI 20060198509, 6 Sep 2007), [12]; *P v Police* (NZHC, CRI 2007412000048, 7 Sep 2007), [2]; *R v Tuporo* (NZCA, BC200662930, 5 Dec 2006), [7], [20]; *The Queen v Shelford and Kingi* [2006] NZCA 306, [10], [27]; *R v Anderson* (NZCA, CA294/04, 9 Mar 2005), [6]; *The Queen v Withey* (NZCA, CA469/03, 13 Sep 2004), [6]; *R v Holtz* [2003] 1 NZLR 667, 671; *The Queen v Seekamut* (NZCA, CA82/03, 10 July 2003), [7], [11], [12]; *Rawiri v R* (NZCA, CA125/03, BC200361652, 25 Sep 2003), [4]; *Wells v R* (NZCA 117/03, 25 Sep 2003), [4]; *The Queen v Mokaraka and Te Hira* (NZCA, CA286/01 and CA294/01, 17 Dec 2001), [5]; *The Queen v Moore and Moore* (NZCA, CA159/00 and CA160/00, 27 July 2000), [14]; *R v Barton* [2000] 2 NZLR 459, [1]; *The Queen v Moore* (NZCA, CA 399/99, 23 Nov 1999), [2]; *R v Dunnill* [1998] 2 NZLR 341, 343; *R v Barlow* [1998] 2 NZLR 477, 479; *R v Hughes* [1998] 1 NZLR 409, 410; *R v Harbour* [1995] 1 NZLR 440, 443; *R v Chapman* [1992] 2 NZLR 380, 381; *R v Pengelly* [1992] 1 NZLR 545, 546; *R v McCallum & Ors* (NZCA, CA350/87, 13 Jul 1988), 2; *R v Samuels* [1985] 1 NZLR 350, 352; *R v George* [1984] 1 NZLR 272, 273; *R v Reed* [1980] 1 NZLR 758, 759; *The Queen v Bennett* (NZCA, 3 April 1978), 2; *R v Rumping* [1962] IX Law Reports 293, 294.

³³ *The Queen v Nuku* [1969] NZLR 343.

³⁴ *The Queen v Voice* (NZCA, 13 Oct 1978), 2.

³⁵ *R v Manapouri* [1995] 2 NZLR 407, 410.

³⁶ *R v M* [1996] 3 NZLR 502, 504.

³⁷ *R v Dunnill* [1998] 2 NZLR 341, 343.

³⁸ *Question of law in The Queen v Cole* (CA 377/99, 18 October 1999), [3].

³⁹ *The Queen v Toman* (NZCA, CA30/04, 24 June 2004), [4], [6].

⁴⁰ *R v Lister* (NZHC, CRI200548553, 31 May 2005), [1].

A fingerprint expert subsequently examined the fingerprint, and he identified the print as having come from Mr C's right ring finger.⁴²

Mr Morrison, for Ms Ryder, acknowledged at the outset that which was inescapable, namely that her fingerprint had been found on two deposit slips and one of the cheques.⁴³

The only evidence against Mr Fenton was the discovery of his fingerprint at the scene of the crime. ... The lower print was positively identified as Mr Fenton's left forefinger fingerprint.⁴⁴

... Mr David was unable to remember using or touching any particular item, but accepted that he must have done so given the fact that his fingerprints had been found on them.⁴⁵

Courts not only re-state the evidence but they frequently endorse the conclusions of fingerprint examiners, sometimes as fact.⁴⁶ In these and other examples, the identification does not appear to be open to contestation. Rather, categorical identification demands an explanation from the suspect/defendant, and that expectation is often explicit:⁴⁷

When asked to explain the presence of his fingerprints ...⁴⁸

... the existence of his fingerprints on items ... obviously required an explanation.⁴⁹

Among the many judicial references to latent fingerprints, there are occasions when the representation appears more equivocal. Consider the following examples, beginning with two extracts from *R v Carter*:

Fingerprint evidence given at trial ... was the only evidence *that linked* Mr Carter to the Holborn Drive address.⁵⁰

If accepted, that evidence proved that his [Carter's] fingerprint was on the recipe for methamphetamine located in the house.⁵¹

... the police found that the fingerprint of his left index finger *matched* the print from the ranchslider door.⁵²

A fingerprint *matching* the appellant's was found on electrical tape on the rubbish bag containing the firearms.⁵³

These examples might exemplify a more balanced or qualified treatment of latent fingerprint evidence that falls short of categorical identification. However, while these

⁴¹ *Solicitor General of New Zealand v Cheng* (NZHC, 19 Sep 2007), [15].

⁴² *C v New Zealand Police* (CRI2007404265, 3 June 2008, High Court, Auckland, Lang J), [10].

⁴³ *R v Ngamu* [2008] DCR 647, 664.

⁴⁴ *Fenton v The Queen* [2011] NZCA 110, [1]-[6].

⁴⁵ *David v The Queen* [2013] NZCA 507, [27], [12]. See also *R v Wilson* [1981] 1 NZLR 316, 319.

⁴⁶ These examples are not all straightforward endorsements. Some merely reiterate the Crown's position or describe agreed facts. Some, however, embody a judge's or court's assessment of the evidence. None recognises or refers to overstatement.

⁴⁷ Compare *Woolmington v DPP* (1935) AC 462. We might desire an explanation, but none is required in our accusatorial system. It is for the Crown to eliminate reasonable doubt and this includes the real possibility, in some cases, of error. See also *Gunn*, vii, x; *The Queen v Leadbitter* [1958] NZLR 336, 338; *The Queen v May* [2008] NZCA 221, [19]-[20].

⁴⁸ *R v Hovell* [1987] 1 NZLR 610, 611, 615.

⁴⁹ *David v The Queen* [2013] NZCA 507, [47]-[48].

⁵⁰ *R v Carter* [2005] 22 NZCA 422, [15]. (italics added)

⁵¹ *Carter*, [41]. (italics added)

⁵² *Tuakana v Police* (NZHC, CRI 201148864, BC201262185, 23 Feb 2012), [10], [18], [20]. (italics added)

⁵³ *R v Tuhoro* [1998] 3 NZLR 568, 570. (italics added)

representations are, to varying degrees, more technically defensible, there is no indication that they are intended to be, or are actually understood as, more qualified representations of latent fingerprint evidence.⁵⁴ In some cases we encounter more qualified treatment alongside categorical identification. Returning to *Carter*, the trial judge stated:

... the evidence against him relied upon by the Crown *is the presence of his fingerprint* on the eight page document containing the recipe for methamphetamine ...⁵⁵

In other cases, the same court seamlessly transitions between categorical and more qualified representations.

It was forensically examined, and fingerprints were collected and they *were matched to you*. ... It was forensically examined and *your fingerprints* were located in the vehicle.⁵⁶

It was not until 19 months later, when as a result of checking the accused's fingerprints following his arrest on a minor and unrelated charge it was found that *they matched* the fingerprints on the door frame and window frame ... Fingerprints ... can be shown *to be those of the accused*.⁵⁷

None of the more qualified examples is inconsistent with categorical identification. No consideration is given to representational 'inconsistencies' in any trial or appeal. In a society where fingerprints are understood as complete proof of identity, the implications of a 'match' do not require elucidation.⁵⁸

These conceptual and representational practices are not limited to trials, transcripts and judgments. Occasionally a judgment affords a glimpse of pre-trial activities. In *R v Samuels*, for example, a police Sergeant's testimony about the interview with a suspect reveals the same tendency to represent fingerprint evidence as definitive proof of identity:

I said, your prints have been found on some of the cannabis inside the case. He said, what do you want me to say. I said, how did they get there. He said I don't know. I said, I believe they're palm prints. He said, I'm in the shit aren't I. I said *prints don't lie*. He said I don't know how they got there.⁵⁹

This recollection of events provides a stark illustration of how fingerprint evidence is represented and understood by investigators as well as those accused of criminal acts.⁶⁰ Fingerprints are unerring. They speak, but do not lie.

4. AUTHORITATIVE MODERN CASES

This section briefly reviews three influential appellate decisions that cast additional light on the form of the opinion as well as the underlying 'methods' employed by fingerprint examiners. The first case considers the now discredited 12 point standard. The second is the first reported decision to refer to ACE-V – the 'method' that replaced mechanistic reliance on a minimum number of similar points.⁶¹ That decision – *R v Carter* – remains

⁵⁴ Such opinions are not readily susceptible to rational evaluation – see Section 5.B.

⁵⁵ *Carter*, [83]. (italics added)

⁵⁶ *Police v Wikaira* [2018] NZDC 5291, [6]-[7], [21], [23]-[25] (italics added). In *Wikaira*, [12], a categorical claim is also made in relation to DNA. See also *R v Julian* [1981] 1 NZLR 743, 745.

⁵⁷ *R v Hovell* [1986] 1 NZLR 500, 502, 506. (italics added)

⁵⁸ See *Wallace v The Queen* [2010] NZCA 46, [69], discussed in Section 4.C.

⁵⁹ *R v Samuels* [1985] 1 NZLR 350, 353. (uncorrected, italics added)

⁶⁰ See also *R v Edwards* [2005] 2 NZLR 709.

⁶¹ The terms 'method' and 'procedure' are used interchangeably throughout this article.

authoritative.⁶² The final case provides insight into the way the Court of Appeal handles simultaneous challenges to DNA and fingerprint evidence. Interestingly, these cases confirm that courts do not require fingerprint examiners to testify in categorical terms. Rather, this is how examiners have elected to characterise their opinions and how their opinions have been adduced by prosecutors. Courts have admitted this evidence and left overstatement and accuracy for the defence and the jury.

A. Points standards and (un)certainty

In *R v Buisson* there was a challenge to latent fingerprint evidence said to link the defendant with a kilogram of hashish.⁶³ If this evidence was accepted, the case against the accused ‘was virtually unanswerable’.⁶⁴ The main grounds of appeal were focused on the number of points of similarity between the two prints and their significance for admissibility and proof.

Two fingerprint examiners called by the Crown identified the latent print on the hashish to Buisson. Defence challenges to opinions about identity are unusual, and in this truly exceptional case the defence called two fingerprint examiners. It was the contention of the defendant/appellant that an examiner was required to locate at least 12 points of similarity between the latent print and a reference print – here the prints of Buisson – before they could declare a match and an identification. The two senior fingerprint examiners called by the state both claimed to observe the requisite minimum of 12 points whereas the retired examiners engaged by the defendant could only locate 7 and 8 points, respectively. There were inconsistencies between the examiners as to whether an identification could be declared and reported with less than 12 points of similarity.

A decade before the English decision in *R v Buckley*, the Court of Appeal explains that there is no legal requirement for a specific minimum number of points before latent fingerprint evidence is admissible on the question of identity.⁶⁵ That is, fingerprint examiners are not required to locate 12 points before testifying and they are not required to opine in categorical terms.⁶⁶ The Court seems to recognise that the point standard was something the community of fingerprint examiners introduced in their anxiety ‘to ensure that fingerprint evidence will always be accepted as certain proof of identity’.⁶⁷

The trial judge summarised the conflicting ‘observations and conclusions of the two sets of expert witnesses’.⁶⁸

You will consider the experience and qualifications and qualifications of each of the experts: how they gave their evidence. You will weigh what you have heard about the need for continually honing skills to fulfill this task and all aspects of the evidence they gave, so that you can reach a conclusion as to what you find on the fingerprint evidence.⁶⁹

On the basis of the examiners’ evidence and the trial judge’s directions the jury was left with ‘the task of evaluating their evidence and deciding which opinion they could

⁶² *R v Carter* [2005] 22 NZCA 422.

⁶³ *R v Buisson* [1990] 2 NZLR 542.

⁶⁴ *Buisson*, 545.

⁶⁵ *R v Buckley* (1999) 163 JP 561.

⁶⁶ *Buisson*, 548. The Court observes that ‘police agencies may be depriving the prosecution of useful information based on a lesser degree of statistical probability.’

⁶⁷ *Buisson*, 547. The influential International Association for Identification (IAI) passed a resolution in 1979 that made it professional misconduct for examiners to provide courtroom testimony about identification as ‘possible, probable, or likely’ rather than ‘certain’. International Association for Identification, ‘Resolution VII, (August 1979) *Identification News* 29. The IAI has slowly responded to the research and reports discussed in Section 5.

⁶⁸ *Buisson*, 547.

⁶⁹ *Buisson*, 548.

accept’.⁷⁰ For the Court of Appeal, the ‘assessment of the reliability and cogency of their opinions was very much a jury matter’.⁷¹ The Court was satisfied that the directions were ‘appropriate ... in the circumstance of this case’.⁷² Though, the ‘desirability’ of warning the jury that ‘the 12 point standard has normally been followed in New Zealand’ was affirmed.⁷³

Buisson is revealing because the case is contested around whether there are twelve points of similarity, not about whether that affects accuracy. There are no references to scientific materials. Points and their significance are explicitly left as issues for the jury to resolve.

B. ACE-V, the elision of points, and the persistence of overstatement

R v Carter represents modern legal authority on latent fingerprint evidence in New Zealand.⁷⁴ As part of a circumstantial case, the Crown adduced latent fingerprint evidence to link a recipe for methamphetamine to Carter. The fingerprint examiner identified Carter based on a single latent fingerprint but did not provide any reasons for the match decision. The appeal focused on the admissibility of the fingerprint evidence given the absence of reasons, as well as the adequacy of the judicial directions.

When questioned about his identification, the fingerprint examiner opaquely referenced the new ACE-V ‘method’ (more below), insisting that ‘the correct application of the science will lead to the correct result’.⁷⁵ Relying on ACE-V and his training and experience, the examiner rejected the possibility of error:

I put the question again, do you accept you could be wrong? No.

Never wrong? ... No, in other things but not in the identification process itself.⁷⁶

...

Why should the jurors simply accept your opinion? ... I have been trained, I have 5 years of training and experience and 8 years of built up experience, training courses and so on and I have been proficiency tested.⁷⁷

When questioned he also candidly acknowledged the subjective dimension of the holistic comparison process associated with ACE-V that ‘*happens in the mind, in the head*’.⁷⁸

The examiner did not make contemporaneous notes or provide reasons for the match and identification. Interestingly, these omissions were inconsistent with ‘uncontroversial’ principles said, by the Court of Appeal, to guide the production of all expert evidence, specifically:

(b) the facts, matters and assumptions on which opinions are expressed must be stated explicitly;

(c) the reasons for opinions given must be stated explicitly;

⁷⁰ *Buisson*, 547.

⁷¹ *Buisson*, 548.

⁷² *Buisson*, 548.

⁷³ *Buisson*, 548.

⁷⁴ *R v Carter* [2005] 22 NZCA 422. See e.g. *Wallace v The Queen* [2010] NZCA 46, [68] and *Wells*, [42]. Carter was decided before the *Evidence Act 2006* was introduced and interpreted to require ‘reliability’.

⁷⁵ *Carter*, [58]. ACE-V was not really new. The process was originally proposed by Roy Huber as a basic method for all feature comparison disciplines. The acronym ACE-V was popularised by David Ashbaugh, of the Royal Canadian Mounted Police and seems to have been taken up with the demise of point standards. See Roy Huber, ‘Expert Witness’ (1959) 2(3) *Criminal Law Quarterly* 276; David Ashbaugh, *Quantitative-Qualitative Friction Ridge Analysis: An Introduction to Basic and Advanced Ridgeology* (CRC Press, 1999).

⁷⁶ *Carter*, [58].

⁷⁷ *Carter*, [58], see also [54]. On the limits of training and experience, see Section 5. On proficiency testing, see below n 169.

⁷⁸ *Carter*, [58] (italics in original), [56].

- (d) any literature or other material used or relied upon to support opinions must be referred to by the expert;
- ...
- (f) if an expert witness believes that his or her evidence might be incomplete or inaccurate without some qualification, that qualification must be stated;
- (g) an expert has an overriding duty to assist the Court impartially on relevant matters within the expert's area of expertise; and
- (h) an expert is not an advocate for any party.⁷⁹

With leave, on appeal, the Crown provided additional materials said to support ACE-V as well as traditional assumptions underpinning latent fingerprint comparison.⁸⁰

Informally, *Carter* announces a shift in the 'method' employed by New Zealand's fingerprint examiners. That is, a shift from reliance on a minimum number of points of similarity to a more holistic approach to comparison. The Court of Appeal summarises the new procedure associated with the acronym ACE-V:

Analysis is the assessment of a friction ridge impression to determine suitability for comparison. *Comparison* is the direct or side by side observation of friction ridge detail to determine whether the detail of two impressions is in agreement based upon similarity, sequence and spacial relationship. *Evaluation* is the formulation of a conclusion based upon analysis and comparison of friction ridge impressions: evaluation may result in individualisation of friction ridge impressions, giving rise to identification or exclusion or an inconclusive result. *Verification* is a peer review process which must occur following a positive identification and which may occur if a finding results in exclusion or an inconclusive result.⁸¹

For the Court of Appeal, the examiner's opinion was effectively 'repaired' by the supplementary materials.

As in *Buisson*, the impugned directions on the fingerprint evidence were generic and provide little in the way of practical assistance.⁸²

*In assessing that evidence, you must have regard to the qualifications and experience of the witnesses, but you have to remember that this is a trial by jury; it is not a trial by expert, and it is for you to decide how much weight or importance you give to the opinions which the expert witnesses have expressed. Indeed, whether you accept them at all in the context of all the evidence that you have heard. You also need to remember that the expert witnesses gave their evidence in relation to their areas of expertise.*⁸³

The trial judge referred to the need to consider 'the fingerprint evidence in conjunction with all the other evidence', and reiterated the Crown's submission that the 'fingerprint evidence ... was "damning"'.⁸⁴

In the end, notwithstanding the absence of reasons and non-compliance with uncontroversial principles applying 'in all cases where expert evidence is called', the Court of Appeal was satisfied that unqualified fingerprint evidence identifying Carter was

⁷⁹ *Carter*, [47]. This is revealing in so far as the non-compliance concerns a type of evidence that is in routine use in investigations and prosecutions. Non-compliance reveals something about the taken-for-granted status of fingerprint comparison and the small number of challenges to the method and resulting identifications. See Edmond, 'Fingerprint evidence in New Zealand's courts: A history of legal challenges'.

⁸⁰ These included: Campbell, 'Fingerprints: A Review' (1985) *Crim LR* 195; Leadbetter, 'Fingerprint Evidence in England and Wales – The Revised Standard' [2005] 45 *Med Sci Law* 1; Vanderkolk, 'Forensic Individualization of Images Using Quality and Quantity of Information' (1999) 49 *Journal of Forensic Identification* 246 and a set of guidelines prepared by fingerprint examiners based in the US. None of these are scientific materials.

⁸¹ *Carter*, [72].

⁸² *Carter*, [82].

⁸³ *Carter*, [80] (italics added).

⁸⁴ *Carter*, [82].

properly admitted and the directions adequate.⁸⁵ Following remarkably limited engagement with the two ‘methods’ and the reasons for the change, *Carter* implicitly endorses the shift to ACE-V and the continuing reception of categorical identification.

C. Probabilistic DNA evidence versus categorical identification by fingerprint

Disparities surface clearly in *Wallace v R*.⁸⁶ There, unwittingly, the Court of Appeal deals with challenges to two different types of feature comparison evidence inconsistently.⁸⁷ The first is a challenge to DNA evidence; that focuses on some relatively novel procedures. Here the Court exhibits concern with validity and reliability, and particularly the way the DNA evidence is expressed. The nuclear DNA profile on a cigarette ‘was 10 million million times more likely to have come from Mr Wallace than from another person selected at random from the general populace.’⁸⁸ Following the Y-STR analysis ‘the appellant could not be excluded as a contributor.’⁸⁹ Comparing this partial profile to a database of New Zealand males, it ‘was 13 times more likely to have originated from Mr Wallace or a paternal relative than from another male randomly selected.’⁹⁰ The prosecutor presented the DNA evidence as ‘consistent with the Crown case but not determinative of it’⁹¹ and ‘noted in closing that this evidence *was not a unique identifier*.’⁹² In summing up the trial judge explained to the jury that the Y-STR and LCN DNA evidence ‘could’ have been from the defendant and victim, respectively.⁹³ There are references to DNA protocols, transfer and contamination and stochastic thresholds. In addition, the judgment provides a brief history of DNA profiling and a discussion of Bayesian inference – the dominant statistical framework for presenting DNA evidence. Perhaps it is ironic, given the treatment of fingerprints (below), that in its discussion of the DNA evidence the Court of Appeal refers to the ‘(dangerous) power of the unqualified finding of an authoritative expert that ... links an accused to the crime scene’.⁹⁴

The fingerprint evidence, in stark contrast, was presented by the state in conventional categorical terms. That version was reiterated by the trial judge who told the jury that the ‘accused’s fingerprint was found in the [victim’s] address book’.⁹⁵ Similarly, the Court of Appeal endorses the examiner’s opinion as fact: a ‘diary was located, with Mr Wallace’s fingerprint on a page.’⁹⁶ Trial counsel focused her cross-examination on the ‘impossibility of aging prints’.⁹⁷ The trial judge ‘gave no specific direction on fingerprint evidence.’⁹⁸

Appellate counsel raised a number of issues pertaining to identification by fingerprint, such as known mistakes, the danger of confirmation bias, and the match decision being merely opinion.⁹⁹ He also sought to introduce the report of a fingerprint examiner from the United States, who could locate only 11 shared points, as fresh evidence. This later

⁸⁵ *Carter*, [47].

⁸⁶ *Wallace v The Queen* [2010] NZCA 46.

⁸⁷ See also *Wells v The Queen* [2014] NZCA 479, [58].

⁸⁸ *Wallace*, [18].

⁸⁹ *Wallace*, [31].

⁹⁰ *Wallace*, [33].

⁹¹ *Wallace*, [40].

⁹² *Wallace*, [38]. (italics added)

⁹³ *Wallace*, [41].

⁹⁴ *Wallace*, [44].

⁹⁵ *Wallace*, [63].

⁹⁶ *Wallace*, [20].

⁹⁷ Trial counsel seems to have focused on timing because of the conceptual difficulty in dealing with the possibility of error.

⁹⁸ *Wallace*, [72].

⁹⁹ These issues suggest some limited awareness of the developments discussed in Section 5.B.

evidence was inattentive to *Buisson* (and *Carter*) and the Court of Appeal notes that the defence witness did not suggest ‘that there is no correlation at all’ between the prints.¹⁰⁰ In passing, there is acknowledgment that challenges to fingerprint evidence are unusual, perhaps ‘because of an ongoing perception that in general fingerprint evidence is irrefutable and safe.’¹⁰¹

It is revealing that the lawyers and judges do not appear to appreciate that DNA comparison and fingerprint comparison are both feature comparison procedures with foundational correspondences.¹⁰² In principle, both should be expressed in empirically-based statistical forms that include some indication of limitations and error. Whereas the Court goes to some length to address the reliability and limitations of the DNA evidence, categorical identification by latent fingerprint passes without serious challenge or judicial qualification.¹⁰³

Together, these examples reinforce the commitment amongst fingerprint examiners to categorical identification even though New Zealand’s courts were open to less stringent forms of opinion about the significance of fingerprint evidence. These three cases are among the tiny proportion of judicial decisions that refer to fingerprint ‘methods’. Though, none is concerned with evidence for the validity or accuracy of either points of similarity or ACE-V. There is no engagement with scientific research and no explanation for the move from point standards to ACE-V.¹⁰⁴ On reflection, this might be considered curious. The fact that a scientific review, conducted for the Forensic Science Service (UK) during the mid 1990s, had dismissed prevailing point standards as arbitrary does not seem to have been disclosed.¹⁰⁵ The fact that ACE-V seems to have been introduced, at least in part, to fill a methodological void is not disclosed or recognised by the lawyers and judges. Rather, ACE-V is presented and accepted as scientific advancement.

We now turn to consider what independent scientific reviews were to make of ACE-V, categorical identification, claims about practical infallibility and subjective interpretation.

5. THE SCIENCE: WHAT WE KNOW ABOUT FINGERPRINT COMPARISON

Scientific reviews provide an independent perspective on fingerprint comparison and the claims of examiners. These important scientific perspectives are absent from both the historical and contemporary treatment of fingerprint evidence in New Zealand’s courts.¹⁰⁶ To put the scientific assessment in context it is useful to introduce the procedures employed by latent fingerprint examiners.

A. A very brief introduction to identification by latent fingerprint

¹⁰⁰ *Wallace*, [75].

¹⁰¹ *Wallace*, [69]. Such observations make persistence with generic directions curious.

¹⁰² See e.g. National Research Council, *Strengthening Forensic Science in the United States: A Path Forward* (National Academies Press, 2009) 7 (‘NRC report’) and President’s Council of Advisors on Science and Technology, Executive Office of the President, *Forensic Science in Criminal Courts: Ensuring Scientific Validity of Feature-Comparison Methods* (Report to the President, September 2016) (‘PCAST Report’) 46ff. According to these scientific organisations, validation is required for all feature-comparison procedures. See Gary Edmond, ‘What lawyers should know about the forensic “sciences”?’ (2014) 36 *Adelaide Law Review* 33.

¹⁰³ It might not be insignificant that Fingerprint Sections are housed within New Zealand police whereas DNA profiling and many other science-based forensic procedures are housed within ESR.

¹⁰⁴ There are references to various guidelines and articles, but these are not consistent with the scientific research and advice discussed in Section 5.

¹⁰⁵ There are no references to Ian Evett and Robin Williams, ‘Review of the Sixteen Points Fingerprint Standard in England and Wales’ (1996) 46(4) *Journal of Forensic Identification* 49.

¹⁰⁶ There was a limited and unsuccessful attempt to bring a few issues to the attention of the Court of Appeal in *Wallace*, [66]-[67] – see Section 4.C.

At its basics, fingerprint comparison involves determining whether a latent fingerprint or other friction ridge print (e.g. palm or foot) from an unknown person is *sufficient* – in terms of quality and quantity – for comparison with another (usually a known or reference) fingerprint.¹⁰⁷ When deemed sufficient, fingerprint examiners look at characteristics in the print (e.g. ridge endings, deltas and whorls), various levels of detail, as well as scars, in order to determine whether two fingerprints match, do not match or are inconclusive. A match decision is a declaration that there are no meaningful differences between two (sufficient) prints *and* the two prints were made by the same person. The underlying logic operates as follows: because fingerprints are unique, if two fingerprints are sufficiently similar (and matched) then they must have been made by the same person. There are, as we shall see, problems with this logic, even if we were to accept underlying assumptions about uniqueness and permanence.¹⁰⁸

Like proverbial snowflakes, the marks left by friction ridge skin (e.g. fingerprints or fingermarks) are never identical.¹⁰⁹ They are always different because of variations in surfaces, oils and residues on hands, the pressure of deposition, their extent, damage to fingers, as well as smudging, sliding, multiple touches, interference and deterioration, the way fingerprints are collected, processed and documented, and so on. ‘Sufficiency’ and ‘match’ (as well as ‘non-match’ and ‘inconclusive’) decisions are inescapably subjective determinations.¹¹⁰ There is, in addition, a ‘leap of faith’ in moving from characterising prints as sufficiently similar to declare a ‘match’ to equating that match with the identification of a specific person.¹¹¹ Focus is often directed to uniqueness and prints being identical rather than the frequency of features (contrast DNA profiling), the conventions, standards and interpretative practices used by examiners, and the risk of error.¹¹²

The way fingerprint examiners undertook their assessment of the sufficiency of prints for comparison, their comparisons, evaluation and processes of review were not always rigorous, meaningfully standardised or temporally ordered. Most of the practices and procedures, including the equation of a match with categorical identification emerged out of examiner beliefs and custom, confusion amongst examiners (and senior police) as to what courts in New Zealand (and elsewhere) required, as well as what courts allowed, rather than scientific research and advice. Historically, there was a tendency to count characteristics (or points) of similarity between prints and to declare a match when some minimum threshold was reached as in *Buisson*. There was international variation around the precise number of points required. Longstanding convention in England and Wales

¹⁰⁷ Brad Ulery et al, ‘Measuring What Latent Fingerprint Examiners Consider Sufficient Information for Individualisation Determinations’ (2015) 10(2) *PLOS One* e0118172. Sometimes unknown prints are compared, for example, in order to link separate crimes to an individual, as in *The Queen v Nuku* [1969] NZLR 343.

¹⁰⁸ For, fingerprint examiners occasionally make errors, and so claims about uniqueness do not overcome a range of interpretive problems and mistakes. These are discussed in Section 5.B. See also Michael Saks and Jonathan Koehler, ‘The Individualization Fallacy in Forensic Science’ (2008) 61 *Vanderbilt Law Review* 199; Simon Cole, ‘Forensics without Uniqueness, Conclusions without Individualization: The New Epistemology of Forensic Identification’ (2009) 8 *Law, Probability, & Risk* 233; Jonathan Koehler and Michael Saks, ‘Individualization claims in forensic science: Still unwarranted’ (2010) 75 *Brooklyn Law Review* 1187.

¹⁰⁹ Contrast the description of the fingerprints as ‘identical’ in *Clancy*. See National Institute of Standards and Technology, *Latent Print Examination and Human Factors: Improving the Practice through a Systems Approach* (Report, February 2012) 204 (‘NIST Report’).

¹¹⁰ That is, when humans are involved. See NRC Report, 8; NIST Report, 39; PCAST report, 5; William Thompson et al, American Association for the Advancement of Science, *Forensic Science Assessments: A Quality and Gap Analysis — Latent Fingerprint Examination* (Report No 2, 15 September 2017) 46ff (‘AAAS Report’).

¹¹¹ AAAS Report, 71: ‘While latent print examiners may well be able to exclude the preponderance of the human population as possible sources of a latent print, there is no scientific basis for estimating the number of people who could not be excluded and, consequently, no scientific basis for determining when the pool of possible sources is limited to a single person.’

¹¹² AAAS Report, 5, 21.

required 16 points. For most of the twentieth century New Zealand Police seem to have required twelve.¹¹³ There was widespread, though misguided, belief that 12 points was sufficiently conservative to eradicate any chance of error – as the Court of Appeal seems to have appreciated in *Buisson*.¹¹⁴

Even with the introduction of the more holistic ACE-V ‘method’ latent fingerprint examiners continue to operate in the shadow of these traditions.¹¹⁵ They also persist with the unprincipled commitment to testifying only in the terms *match* (categorical identification), *non-match* and *inconclusive* (usually expressed in the pro-prosecution form ‘cannot exclude’). Unlike the probabilistic results associated with DNA profiling (e.g. in *Wallace*), there is no insight into the probative value of ‘inconclusive’ and ‘match’ decisions.¹¹⁶ Fingerprint examiners exaggerate the significance of a match and tend to under-value inconclusive decisions.

Beginning in the 1970s police agencies around the world began to introduce computer programs (e.g. AFIS) to store and search their ever-expanding fingerprint collections. Even today, as algorithms are becoming increasingly powerful, in most jurisdictions it is an examiner who makes the decision about which of the prints returned by the algorithm search to compare and whether specific prints match. At its core latent fingerprint comparison remains a subjective human process. And, as the number of fingerprints available through electronic databases expands into the tens and hundreds of millions, the chance of adventitious matching – i.e. mis-matching very similar looking prints from different persons (especially latent prints at the limits of sufficiency) – increases.

B. Independent scientific reviews

In recent decades external scientific (and scholarly) interest in latent fingerprint comparison, and the forensic sciences more generally, has increased exponentially.¹¹⁷ There are a number of reasons for this attention, beginning with ‘spill-over’ from early critiques of handwriting *comparison* in the late 1980s, more targeted studies of the history of latent fingerprint comparison in the United States (especially the work of Simon Cole), and, perhaps more significantly, admissibility challenges in the United

¹¹³ See e.g. *R v Samuels* [1985] 1 NZLR 350 and the discussion in Section 4.A.

¹¹⁴ See Evett and Williams, ‘Review of the Sixteen Points Fingerprint Standard in England and Wales’.

¹¹⁵ See e.g. *Wells v The Queen* [2014] NZCA 479, [60].

¹¹⁶ PCAST Report, 6; AAAS Report, 11, 21, 23, 63-68.

¹¹⁷ See e.g. David L Faigman, Elise Porter and Michael Saks, ‘Check Your Crystal Ball at the Courthouse Door, Please: Exploring the Past, Understanding the Present, and Worrying about the Future of Scientific Evidence’ (1994) 15 *Cardozo Law Review* 1799; Michael Saks, ‘Merlin and Solomon: Lessons from the Law’s Formative Encounters with Forensic Identification Science’ (1998) 49 *Hastings Law Journal* 1069; Michael Risinger & Michael Saks, ‘A House with No Foundation’ (2003) 20 *Issues in Science & Technology* 35; J Moriarty & Michael Saks, ‘Forensic Science: Grand Goals, Tragic Flaws, and Judicial Gatekeeping’ (2005) 44 *Judges’ Journal* 16; Michael Saks, ‘Banishing the *Ipse Dixit*: The Impact of *Kumho Tire* on Forensic Identification Science’ (2000) 57 *Wash & Lee Law Review* 879; Margaret Berger, ‘What Has a Decade of *Daubert* Wrought?’ (2005) 95 *American Journal of Public Health* S59; Margaret Berger, ‘Expert Testimony in Criminal Proceedings: Questions *Daubert* Does Not Answer’ (2003) 33 *Seton Hall L Rev* 1125; David Faigman, *Legal Alchemy: The Use and Misuse of Science in the Law* (New York: WH Freeman, 1999); William Thompson, ‘Analyzing the Relevance and Admissibility of Bullet Lead Evidence: Did the NRC Report Miss the Target?’ (2005) 46 *Jurimetrics Journal* 65; Erica Beecher Monas, *Evaluating Scientific Evidence: An Interdisciplinary Framework for Intellectual Due Process* (New York: Cambridge University Press, 2007). See also Kelly Pyrek, *Forensic Science under Siege: The Challenges of Forensic Laboratories and the MedicoLegal Death Investigation System* (London: Academic Press, 2007); Gary Edmond and Kent Roach, ‘A contextual approach to the admissibility of the state’s forensic science and medical evidence’ (2012) 61 *University of Toronto Law Journal* 343. Issues are discussed in standard US reference works, such as David Faigman et al, *Modern Scientific Evidence: The Law and Science of Expert Testimony* (Eagan, MN: Thomson/West 2016); Paul Giannelli and Edward Imwinkelried, eds, *Scientific Evidence* (Newark, NJ: LexisNexis, 2012).

States combined with several high profile mis-identifications (notably Brandon Mayfield in the United States and Shirley McKie in Scotland).¹¹⁸

A range of pre-eminent scientific and technical organisations – including the National Research Council of the National Academy of Sciences (NRC report), the National Institute for Standards and Technology (NIST report), the President’s Council of Advisers on Science and Technology (PCAST report), the American Association for the Advancement of Science (AAAS report) – undertook reviews of the forensic sciences.¹¹⁹ All of the resulting reports considered latent fingerprint comparison, with the NIST and AAAS reports being exclusive in their focus. The independent committees responsible for these reports – composed of multidisciplinary collectives of scientists, biomedical researchers, engineers and statisticians – were surprised and remarkably critical of what they encountered. Five issues drawn from the scientific reviews will enhance our understanding of latent fingerprint comparison.¹²⁰ Let’s begin with the modern incarnation of the ‘method’.

ACE-V is understood and represented by examiners – as in *Carter* – as (practically) infallible.¹²¹ It is used to support the equation of match decisions with categorical identification of a specific person.¹²² Yet, when independent scientists came to examine the research supporting latent fingerprint comparison they could find no validation studies.¹²³ That is, there were no studies that had formally evaluated latent fingerprint examiners and their procedures (including ACE-V), to determine validity and, specifically, their reliability or accuracy.¹²⁴ A seminal review by the National Research Council (NRC report) of the National Academy of Sciences (US) made a critical assessment that extended well beyond fingerprint comparison. Exempting nuclear DNA analysis, the NRC concluded that: ‘no forensic method has been rigorously shown to have the capacity to consistently, and with a high degree of certainty, demonstrate a connection between evidence and a specific individual or source.’¹²⁵ This statement sits very awkwardly against claims by latent fingerprint examiners that they could identify specific individuals with certitude, and judicial assertions that fingerprint comparison was

¹¹⁸ See e.g. Michael Risinger, M Denbeaux and Michael Saks, ‘Exorcism of Ignorance as a Proxy for Rational Knowledge: The Lesson of Handwriting “Expertise”’ (1989) 137 *University of Pennsylvania Law Review* 731; Office of the Inspector General, *A Review of the FBI’s Handling of the Brandon Mayfield Case* (US Department of Justice, March 2006); A. Campbell, *The Fingerprint Inquiry Report* (Edinburgh: APS Group Scotland, 2011) (‘The Fingerprint Inquiry’); *US v Mitchell*, 365 F.3d 215 (3d Cir. 2004) (cited in *Carter*, [63]); *United States v Llera Plaza* 179 F. Supp. 2d 492 (E.D. Pa 2002); *United States v Llera Plaza* 188 F. Supp. 2d 549 (E.D. Pa. 2002). See also Cole, *Suspect Identities*.

¹¹⁹ National Research Council, *Strengthening Forensic Science in the United States: A Path Forward* (National Academies Press, 2009) (‘NRC Report’); Expert Working Group on Human Factors in Latent Print Analysis, National Institute of Standards and Technology, *Latent Print Examination and Human Factors: Improving the Practice through a Systems Approach* (Report, February 2012) (‘NIST Report’); PCAST Report; William Thompson et al, American Association for the Advancement of Science, *Forensic Science Assessments: A Quality and Gap Analysis — Latent Fingerprint Examination* (Report No 2, 15 September 2017) (‘AAAS Report’).

¹²⁰ Readers will benefit from direct engagement with the various reports and ongoing research, as well as publications by NIST (in the United States) and the Forensic Science Regulator (in the United Kingdom). See e.g. Forensic Science Regulator, *Codes of Practice and Conduct: Fingerprint Comparison FSR-C-128* (Home Office, 2017), 13, [12.1.2]–[12.1.3].

¹²¹ Errors are sometimes said to be caused by examiners, rather than the method. Though, see Simon Cole, ‘More than Zero: Accounting for Error in Latent Fingerprint Identification’ (2005) 95 *Journal of Criminal Law & Criminology* 985.

¹²² Often in conjunction with assumptions about permanence and uniqueness, and the long training and experience possessed by examiners.

¹²³ NRC Report, 142–5, citing Lyn Haber and Ralph N Haber, ‘Scientific validation of fingerprint evidence under *Daubert*’ (2008) 7 *Law, Probability & Risk* 87–109.

¹²⁴ For a definition of ‘validity’, see PCAST Report, 44–66. In layman’s terms, validity addresses the issue of whether a procedure does what it is said (or intended) to do, the conditions in which it is known to do so, and how well.

¹²⁵ NRC Report, 7, 100.

effectively beyond challenge given its basis in ‘known scientific facts’ – see Sections 2, 3 and 4.

In its review of latent fingerprint comparison, the NRC report and subsequent reviews, offered a disruptive assessment of ACE-V. Rather than an infallible method, the NRC explained that:

ACE-V provides a broadly stated framework for conducting friction ridge analyses. However, this framework is not specific enough to qualify as a validated method for this type of analysis. ACE-V does not guard against bias; is too broad to ensure repeatability and transparency; and does not guarantee that two analysts following it will obtain the same results. For these reasons, merely following the steps of ACE-V does not imply that one is proceeding in a scientific manner or producing reliable results.¹²⁶

ACE-V was recognised for what it is; an inescapably subjective process that lacks meaningful standards. Some examiners commence with comparison and many bureaux continue to rely on non-blind verification.¹²⁷

This leads to the second point. Latent fingerprint examiners have claimed that a match decision represents the identification of a specific person and that fingerprints ‘do not lie’. When independent scientists eventually reviewed these claims they were rejected out of hand. The NRC concludes that ‘there is limited information about the accuracy and reliability of friction ridge analyses’ but ‘claims that these analyses have zero error rates are *not scientifically plausible*.’¹²⁸ According to the NRC, claims about ““positive” identification should be replaced by more modest claims about the meaning and significance of a “match.””¹²⁹ A report prepared by the President’s Council of Advisers on Science and Technology (PCAST report) draws attention to ‘the long history of exaggerated claims for the accuracy of forensic methods includes the DOJ’s [Department of Justice (US)] own prior statement that latent fingerprint analysis was “infallible”.’¹³⁰ The American Association for the Advancement of Science (AAAS) described ‘traditional’ claims ‘to be able to “identify” the source of a latent print with 100% accuracy ... as *indefensible*.’¹³¹

A report prepared under the auspices of the US National Institute of Standards and Technology (NIST) recommended against equating match decisions with categorical identification (or individualisation).

Because empirical evidence and statistical reasoning do not support a source attribution to the exclusion of all other individuals in the world, latent print examiners should not report or testify, directly or by implication, to a source attribution to the exclusion of all others in the world.¹³²

Simultaneously, The Fingerprint Inquiry in Scotland, reviewing the McKie case, recommended that ‘[e]xaminers should discontinue reporting conclusions on

¹²⁶ NRC Report 142-143; NIST Report, 9, 123. See also Saks and Koehler, ‘The Individualization Fallacy in Forensic Science’; Cole, ‘Forensics without Uniqueness’; Koehler and Saks, ‘Individualization claims in forensic science’.

¹²⁷ In the aftermath of the NRC and NIST reports, the FBI has adopted Linear ACE-V where careful attention is directed toward the steps being completed in sequence, particularly analysis of observable features of the latent print before comparison with another (usually known) print.

¹²⁸ NRC Report, 142 (italics added) and 143: ‘clearly unrealistic’.

¹²⁹ NRC Report, 142, quoting Jennifer Mnookin, ‘The Validity of Latent Fingerprint Identification: Confessions of a Fingerprinting Moderate’ (2008) 7 *Law, Probability & Risk* 127

¹³⁰ PCAST Report 54, n124.

¹³¹ AAAS Report, 71 (italics added), see also 9, 60.

¹³² NIST Report, 197: Recommendation 3.7, see also 106.

identification or exclusion with a claim to 100% certainty or on any other basis suggesting that fingerprint evidence is infallible.’¹³³

Concerned about widespread over-claiming, and eager to determine validity and reliability in the wake of the NRC report, research scientists began to study the performance of latent fingerprint examiners. The first studies confirmed that trained examiners are very good, and much better than novices (i.e. laypersons such as judges and jurors), at comparing prints. Significantly, however, independent study found small numbers of false positive errors (i.e. mistaken identifications) and false negative errors (i.e. misses). Based on a couple of black box studies (see Table 1), PCAST concludes that latent fingerprint comparison is *foundationally* valid.¹³⁴ This came, no doubt, as welcome relief.¹³⁵ Simultaneously, however, the President’s Council expresses concerns about the way comparisons are routinely undertaken in practice – i.e. as *applied*.¹³⁶ This embodied unresolved issues relating to standards, the lack of rigorous proficiency testing as well as risks posed by confirmation and contextual bias.

Study	False Positives			
	Raw Data	Freq. (Confidence bound)	Estimated Rate	Bound on Rate
Early studies				
Langenburg (2009a)	0/14	0% (19%)	1 in ∞	1 in 5
Langenburg (2009b)	1/43	2.3% (11%)	1 in 43	1 in 9
Langenburg et al. (2012)	17/711	2.4% (3.5%)	1 in 42	1 in 28
Tangen et al. (2011) (“similar pairs”)	3/444	0.68% (1.7%)	1 in 148	1 in 58
Tangen et al. (2011) (“dissimilar pairs”)	0/444	0% (0.67%)	1 in ∞	1 in 148
Black-box studies				
Ulery et al. 2011 (FBI)**	6/3628	0.17% (0.33%)	1 in 604	1 in 306
Pacheco et al. 2014 (Miami-Dade)	42/995	4.2% (5.4%)	1 in 24	1 in 18
Pacheco et al. 2014 (Miami-Dade) (excluding clerical errors)	7/960	0.7% (1.4%)	1 in 137	1 in 73

Table 1: Error rates in studies of latent print analysis.¹³⁷

On the basis of the available research PCAST concludes that the ‘false positive rate ... is substantial and is likely to be higher than expected by many jurors based on longstanding claims about the infallibility of fingerprint analysis.’¹³⁸ PCAST and the AAAS emphasised the need to provide decision-makers with more information:

Members of the public are likely to hold misconceptions about latent print examination that have been shaped by decades of overstatement by latent print examiners. To combat these misperceptions, latent print examiners should include specific caveats in reports that

¹³³ *The Fingerprint Inquiry*, 741: Recommendation 3.

¹³⁴ PCAST Report, 52-53, 101-102. According to the PCAST Report, 4, 56, ‘Foundational validity . . . means that a method can, in principle, be reliable’ and ‘[v]alidity as applied means that the method has been reliably applied in practice.’ Foundational validity confirms that a procedure works when tested in controlled conditions, whereas the question of whether it works in its various real world applications raises validity as applied.

¹³⁵ On ‘black box’ studies, see PCAST Report, 5-6: ‘For subjective feature-comparison methods [such as latent fingerprint comparison], because the individual steps are not objectively specified, the method [i.e. ACE] must be evaluated as if it were a “black box” in the examiner’s head. Evaluations of validity and reliability must therefore be based on “black-box studies,” in which many examiners render decisions about many independent tests (typically, involving “questioned” samples and one or more “known” samples) and the error rates are determined.’

¹³⁶ PCAST Report, 66, 102: ‘there are a number of important issues related to its validity as applied.’

¹³⁷ PCAST Report, 98. The ‘bound on rate’ is a statistical estimate, that refers to the ‘odds of a false positive occurring, based on the upper 95 percent confidence bound—that is, the rate could reasonably be as high as this value.’

¹³⁸ PCAST Report, 910.

acknowledge the limitations of the discipline. They should acknowledge: (1) that the conclusions being reported are opinions rather than facts (as in all pattern-matching disciplines), (2) that it is not possible for a latent print examiner to determine that two friction ridge impressions originated from the same source to the exclusion of all others; and (3) that errors have occurred in studies of the accuracy of latent print examination.¹³⁹

Both PCAST and the AAAS insist that disclosure and explanation are important because misconceptions are pervasive.¹⁴⁰

The third point concerns the real risks created by the historical failure to attend to human factors, especially cognitive bias, associated with interpretive processes. These concerns entered prominence just over a decade ago when a cognitive scientist induced experienced latent fingerprint examiners to reverse their opinion about whether two fingerprints matched by exposing them to extraneous information about the fingerprints they were comparing.¹⁴¹ This admittedly small experiment had a profound impact, in part because of the claims examiners had made about their method and abilities. Subsequently, all of the scientific reviews have drawn attention to the desirability of shielding examiners from domain-irrelevant information.¹⁴² Historically, fingerprint examiners were exposed, or had access, to information extraneous to the task of comparison – such as criminal records and investigators’ beliefs about the identity of the perpetrator. Additionally, it was common for examiners to undertake Analysis, Comparison and Evaluation simultaneously – with the prints side by side – notwithstanding the risks this introduced.¹⁴³ Verification was rarely, if ever, blind.¹⁴⁴ The person(s) reviewing the decision knew they were reviewing a match, frequently in conjunction with the identity of the original examiner.¹⁴⁵ We now know that each of these practices increases the risk of error.

The fourth point concerns assumptions about permanence and uniqueness.¹⁴⁶ Notwithstanding routine presentation as biological fact, we do not know whether friction ridge skin is unique.¹⁴⁷ But that is less important than it might at first appear.¹⁴⁸ We do know that friction ridge skin is highly variable – and this is all that is required for it to have value in *assisting* with issues of identity.¹⁴⁹ Uniqueness does not solve the problem of identity or eliminate error because individual examiners have to make decisions about whether a particular latent is sufficient for analysis and, if it is deemed so, to make a

¹³⁹ AAAS Report, 9, 73.

¹⁴⁰ NAS Report, 53: ‘The bottom line is simple: In a number of forensic science disciplines, forensic science professionals have yet to establish either the validity of their approach or the accuracy of their conclusions, and the courts have been utterly ineffective in addressing this problem’. See also Law Commission of England and Wales, *Expert Evidence in Criminal Proceedings in England and Wales* (2011).

¹⁴¹ I. Dror, D. Charlton and A. Peron, ‘Contextual information renders experts vulnerable to making erroneous identifications’ (2006) 156 *Forensic Science International* 74; I. Dror and R. Rosenthal, ‘Meta-analytically quantifying the reliability and biasability of forensic experts’ (2008) 53 *Journal of Forensic Science* 900.

¹⁴² NRC Report; *The Fingerprint Inquiry*; NIST Report; PCAST Report and the AAAS Report.

¹⁴³ See e.g. AAAS Report, 8: Recommendation 8.

¹⁴⁴ If verification ever ‘caught’ errors or disagreements they were not disclosed. On the value of verification, see Kaye Ballantyne et al, ‘Peer review in forensic science’ (2017) 277 *Forensic Science International* 66.

¹⁴⁵ Part of the human condition, cognitive vulnerabilities are the reason sophisticated biomedical researchers employ double blind clinical trials and many other scientists use forms of blinding. See the discussion in Barker Bausell, *Snake oil science: The truth about complimentary and alternative medicine* (Oxford, 2007) and Harry Collins, *Gravity’s Ghost: Scientific Discovery in the Twenty First Century* (Chicago, University of Chicago Press, 2012).

¹⁴⁶ NRC Report, 188–9.

¹⁴⁷ Or, more colloquially, fingerprints.

¹⁴⁸ PCAST Report, 62: ‘uniqueness studies miss the fundamental point. The issue is not whether *objects* or *features* differ; they surely do if one looks at a fine enough level. The issue is how well and under what circumstances *examiners* applying a given metrological method can reliably *detect* relevant differences in features to reliably identify whether they share a common source.’

¹⁴⁹ DNA is not unique, but DNA profiling is nevertheless a very powerful means of *helping to discriminate* between and to identify persons.

decision about whether two prints match. Regardless of whether friction ridge skin is unique, examiners make occasional errors in these subjective determinations. Consequently, examiners and lawyers should be less concerned about appealing to uniqueness as some sort of explanation for practical infallibility and more concerned with explaining and avoiding real risks of error.

Finally, the scientific reports responded to the popular impression that training and experience, conventional standards (e.g. the 12 point minimum), institutional arrangements (e.g. proficiency testing), accreditation and so on, could substitute for the need to validate procedures and maintain vigilance around performance. Consider the emphatic response from PCAST:

... neither experience, nor judgment, nor good professional practices (such as certification programs and accreditation programs, standardized protocols, proficiency testing, and codes of ethics) can substitute for actual evidence of foundational validity and reliability. ... Similarly, an expert's expression of confidence based on personal professional experience or expressions of consensus among practitioners about the accuracy of their field is no substitute for error rates estimated from relevant studies. For forensic feature-comparison methods, establishing foundational validity based on empirical evidence is thus a *sine qua non*. Nothing can substitute for it.¹⁵⁰

C. A couple of caveats

There are two important points to reinforce. First, ongoing scientific research confirms that latent fingerprint evidence is foundationally valid. While there are lingering concerns around the way ACE-V is applied in practice, latent fingerprint evidence should be relied upon in investigations and prosecutions. The main problems are the continuing failure to recognise real threats, especially around the limits of procedures, the lack of standards, cognitive bias, and exaggerating the value and accuracy of latent fingerprint evidence. Latent fingerprint evidence should be admissible in criminal proceedings provided the evidence is disciplined by the results of scientific research – as PCAST and the AAAS advise.

This leads onto a second practical issue. The risk of error is lower where there are multiple prints and/or independent evidence of guilt – as in *Gunn* and *Wallace*. Where there are multiple fingerprints, especially where they are attributed to different fingers of the same person, the chance of an error will be dramatically reduced. In many cases, independent evidence of guilt will suggest that it is unlikely that an error has been made. These are ultimately issues for the jury, but it is important that they are explained at trial where identity is in issue. A case with one or more fingerprints and independent evidence is markedly different from a case relying on a single fingerprint for identification.

6. PROACTIVELY DISCLOSING LIMITATIONS AND ERROR

The contention that fingerprint examiners can unerringly identify persons is inconsistent with both scientific studies and the advice of some of the world's leading collectives of scientists. During more than a century of representation and reliance, lawyers and judges did not recognise this, along with a number of additional non-trivial limitations with fingerprint comparison. Regardless of whether examiners were counting points or using ACE-V, and notwithstanding technological developments (such as AFIS), New Zealand's fingerprint examiners equated subjective match decisions with the categorical identification of specific individuals. There are no references to limitations in reported cases; although *Buisson* expresses concerns about 'understatement' following the

¹⁵⁰ PCAST Report, 6.

reluctance of examiners to testify in other than categorical terms. Consequently, the most ubiquitous forensic science of the twentieth century was invariably exaggerated in ways that systematically privileged the Crown. The presentation of latent fingerprint evidence as complete evidence of identity shifted responsibility onto defendants – often impecunious and dependent on publicly-funded lawyers – to identify and explain limitations, including the possibility of a mistake.

The apparent failure of trial and appellate processes to identify and convey limitations, along with failure of the state's fingerprint examiners to disclose them, raises serious questions about the effectiveness of quotidian trials and appeals.¹⁵¹ While we might be inclined to excuse past generations for their credulity and relaxed approach to reliability, commitments that now appear partisan effectively insulated the state against the need to formally evaluate the many forensic 'sciences' in its arsenal.¹⁵² It is, however, more difficult to excuse the performance of modern fingerprint examiners. They changed their 'method' in response to scientific criticism from the mid 1990s but without disclosing the reasons to prosecutors or the courts.¹⁵³ All contemporary fingerprint examiners are aware of the scientific reviews and validation studies discussed in Section 5, but they have yet to bring them to the attention of courts. They are yet to modify their reports and opinions in ways that incorporate mainstream scientific research and advice. Is this what we expect of state-employed experts with a responsibility to 'assist the Court impartially'?

Similarly, modern prosecutors and defence lawyers have not effectively drawn attention to epistemological issues; specifically, the need to recalibrate how latent fingerprint evidence is presented and, where contested, explained.¹⁵⁴ Judges have also contributed to this state of affairs by allowing and even endorsing categorical identification and expecting defendants to identify actual mistakes.¹⁵⁵ Such expectations are unrealistic for two main reasons. First, because fingerprint evidence was, and is, treated and understood as practically infallible. Secondly, even if an examiner did make a mistake, in the vast majority of cases it would be exceedingly difficult for a defendant to expose it (let alone persuade a decision-maker). How is a defendant supposed to expose, as mistaken, perceptions and interpretations that take place inside an examiner's head?¹⁵⁶ Apart from cases where there is independent evidence of non-guilt – cases that are unlikely to make it to trial – how does a defendant demonstrate that the wrong person has been identified?¹⁵⁷

Fortuitously, recent studies provide means of addressing the problem of systematic overstatement. Scientific research confirms the validity and reliability of the basic approach. With this in mind, we are at the point to consider how latent fingerprint evidence ought to be presented in reports and testimony (regardless of whether it is

¹⁵¹ See generally, Gary Edmond and Mehera San Roque, 'The Cool Crucible: Forensic Science and the Frailty of the Criminal Trial' (2012) 24 *Current Issues in Criminal Justice* 51; Gary Edmond, Emma Cunliffe, Kristy Martire and Mehera San Roque, 'Forensic science and the limits of cross-examination' (2019) 42 *Melbourne University Law Review* 858.

¹⁵² Some comparison processes, such as glass, DNA, blood and various chemical assays were validated. It is also important to recognise that historically reliability was not an admissibility criterion and judges were inclined to leave issues of reliability to the jury. See, e.g. *R v Buisson* [1989] 2 NZLR 370, 371.

¹⁵³ Any implications for past convictions were thereby not considered.

¹⁵⁴ Gary Edmond, 'Expert Evidence and the Professional Responsibilities of Prosecutors' in P. Roberts et al (eds), *Integrity in the Criminal Process* (Oxford, Hart, 2015). See also Edmond, 'Fingerprint evidence in New Zealand's courts: A history of legal challenges'.

¹⁵⁵ Directions on fingerprint evidence are at best perfunctory; and frequently misguided and misleading.

¹⁵⁶ Agreement between examiners may not be an appropriate solution. Consider the consensus around mistaken decisions in Mayfield and McKie, above n 118.

¹⁵⁷ Technically, they only need to raise a doubt. The expectation that the defence will expose foundational issues and overstatement is inconsistent with the burdens on prosecutors and expert witnesses not to overstate the value of evidence and to present expert evidence in a manner susceptible to rational evaluation. See e.g. *Davie v Magistrates of Edinburgh* 1953 SC 34, 39-40.

contested). PCAST provides a useful model. According to the President's Council, where latent fingerprint evidence is adduced:

... it would be appropriate to inform jurors that (1) only two properly designed studies of the accuracy of latent fingerprint analysis have been conducted and (2) these studies found false positive rates that could be as high as 1 in 306 in one study and 1 in 18 in the other study. This would appropriately inform jurors that errors occur at detectable frequencies, allowing them to weigh the probative value of the evidence.¹⁵⁸

This approach qualifies match decisions – i.e. the claim to have identified a specific individual – from a single fingerprint based on what is known about human performance.¹⁵⁹ The identification is qualified by incorporating the best estimate of performance based on currently available studies.¹⁶⁰ It renders *the opinion* susceptible to comprehension and rational evaluation.¹⁶¹ Decision-makers are provided with information about performance and accuracy rather than having to rely on experience, confidence and popular (mis-)conceptions.¹⁶²

Scientists tested fingerprint examiners from the US (e.g. Ullery et al) and Australia (e.g. Tangen et al) with fingerprints resembling the kinds of prints they examine in routine casework.¹⁶³ There are differences between these studies and casework but it is unclear whether they matter.¹⁶⁴ Regardless, we should not persist with overstatement that is inconsistent with all of the mainstream scientific advice in the absence of jurisdiction-specific research – i.e. because New Zealand's examiners have yet to be rigorously tested. We should not persist with overstatement on the speculative basis that New Zealand's fingerprint examiners might turn out to be better than examiners employed by the FBI and police agencies in Australia. This would be to perpetuate exaggeration and place upon the defence a burden that is inconsistent with our accusatorial tradition.¹⁶⁵ For the defence is never in a position to formally test forensic science procedures.¹⁶⁶ Rather, the state must evaluate procedures and present the results 'warts and all'. The state should use the best scientifically-derived evidence available and, where appropriate, disclose issues that bear upon accuracy.¹⁶⁷ There may be technical debates around how to measure and represent error, particularly for criminal justice audiences. There is no simple answer here.¹⁶⁸ The essential point is to make a good faith attempt to capture and convey the

¹⁵⁸ PCAST report, 96.

¹⁵⁹ Victoria Police disclose indicative error rates in their reports. See Gary Edmond, Kristy Martire and Mehera San Roque, 'Expert Reports in the Forensic Sciences' (2017) 40 *UNSW Law Journal* 590.

¹⁶⁰ Error rates may change, particularly if institutions endeavour to use the scientific research to improve performance.

¹⁶¹ Gary Edmond, 'Forensic science evidence and the conditions for rational (jury) evaluation' (2015) 39 *Melbourne University Law Review* 75.

¹⁶² See the discussion in Edmond et al, 'Expert Reports in the Forensic Sciences'; Gary Edmond, Matthew Thompson and Jason Tangen, 'A guide to interpreting forensic testimony: Scientific approaches to fingerprint evidence' (2013) 13 *Law, Probability & Risk* 1–25.

¹⁶³ Neither study incorporated a 'verification' stage. Consequently the precise value of verification, particularly non-blind verification remains uncertain. Similarly, there was no peer review and examiners knew they were engaged in important studies with the potential to inform how their evidence would be presented (in courts). See Ballantyne et al, 'Peer review'.

¹⁶⁴ Differences might be raised on the voir dire or during trial, but in the absence of empirical evidence prosecutors and courts should be reluctant to assume that procedures such as non-blind verification eliminate errors.

¹⁶⁵ David Faigman, John Monahan and Christopher Slobogin, 'Group to Individual (G2i) Inference in Scientific Expert Testimony' (2014) 81(2) *University of Chicago Law Review* 417.

¹⁶⁶ Merely raising the failure to validate is unlikely to make a difference. Though, this approach was proposed by the English Court of Appeal in *R v Atkins* [2009] EWCA Crim 1876.

¹⁶⁷ The quantity and quality of the image and blind verification, for example.

¹⁶⁸ See e.g. Kristy Martire et al, 'The expression and interpretation of uncertain forensic science evidence: verbal equivalence, evidence strength, and the weak evidence effect' (2013) 37 *Law and Human Behavior* 197, and more generally, Gerd Gigerenzer et al, "'A 30% chance of rain tomorrow': how does the public understand

known value of the evidence. In the absence of reliable information about New Zealand's examiners we should draw upon the best available evidence of performance based on examiner's using similar methods – as PCAST recommends.¹⁶⁹

We can obtain some idea about how this might operate at trial by revisiting the facts of *Carter* – see Section 4.B. Carter was convicted for attempting to manufacture methamphetamine. The case against him included: preparatory chemicals and apparatus located at a domestic residence; a vehicle registered in his wife's name parked outside that residence; his appearance in a nearby street in the early hours of the morning; his flight from the scene when approached by police; his capture in possession of ammunition similar to that recovered inside the residence; and a latent fingerprint on a 'recipe' in the residence used to categorically identify him. Carter's counsel challenged the admissibility of some of this evidence, particularly the fingerprint match given the absence of reasons.

We now know that the examiner's opinion should not have been presented in categorical terms or described as practically infallible. To be clear, latent fingerprint evidence should be admissible provided the opinion is supplemented with an indication of error.¹⁷⁰ The fingerprint examiner (or some scientifically-sophisticated witness) should explain that fingerprint evidence is opinion and that when formally tested in controlled conditions fingerprint examiners make false positive errors – i.e. mis-identifications – in about 1 in 306 decisions.¹⁷¹

Presenting latent fingerprint evidence in a manner consistent with the best available scientific advice would not threaten the vast majority of prosecutions and convictions but would make trials fairer and improve the accuracy of decision-making. If the fingerprint evidence had been presented with an indicative error rate the likelihood of convicting Carter remains high. For, when evaluating the case against Carter, the jury were expected to consider all of the admissible evidence. The real possibility of a mistake in the identification might be confidently discounted when the fingerprint evidence is considered in conjunction with the other evidence.¹⁷² The risk of error – of Carter being mis-identified given the other circumstantial evidence – is very low.¹⁷³ In this scientifically-inflected form the fingerprint evidence remains probative and the case compelling.

Critics might dismiss the insights in this article as trivial. I can imagine a few contending that (almost) every case considered was appropriately decided. Or, that at most, all I have achieved is to locate a small oversight in the way fingerprint evidence has been expressed that has emerged in recent years. There are several points to make here. First, as the NRC, NIST, PCAST and AAAS reports make clear, there is a big difference

probabilistic weather forecasts?' (2005) 25 *Risk Analysis* 623.

¹⁶⁹ It would, however, be a mistake to rely on current proficiency testing. The President of Collaborative Testing Services, one of the major commercial providers recently explained that, '[e]asy tests are favoured by the [forensic science] community', see PCAST report, 57, 68. These tests seem to be designed to facilitate compliance with regulatory frameworks (e.g. accreditation) and may not reveal much about abilities or accuracy. Such revelation, along with a history of selective disclosure and omission, reinforce the need to have independent scientists involved in designing and conducting rigorous studies.

¹⁷⁰ See also See Jonathan Koehler, 'Fingerprint error rates and proficiency tests: What they are and why they matter' (2008) 59 *Hastings Law Journal* 1077 and 'Proficiency tests to estimate error rates in the forensic sciences' (2013) 12 *Law, Probability and Risk* 89.

¹⁷¹ Alternatively, they might also use the 1 in 604 figure from Table 1. Less turns on the figure than acknowledging the reality of error and providing a good faith estimate based on rigorous empirical studies. Empirically-based reasons for preferring different error rates might be raised. This is preferable to leaving the issue for the defendant and defence counsel.

¹⁷² Especially where examiners are not engaged in suggestive procedures and are blinded from gratuitous information about the investigation.

¹⁷³ This assumes that the fingerprint comparison was independent of the other evidence.

between an infallible identification and a match decision that assists with identification but where empirical studies have found examiners make errors somewhere between 1 in 18 and 1 in 306 comparisons. Secondly, this oversight has yet to be addressed or even conceded. Thirdly, in most trials and appeals we do not know the correct decision regarding identification or guilt. Consequently, we should be cautious when invoking claims about putatively correct trial outcomes to support the use or accuracy of a forensic science procedure (or the effectiveness of our system of trials and appeals). This is why the rigorous independent testing of forensic science procedures is essential. So we can determine whether they work and how well.¹⁷⁴ Relying on case outcomes is tautological and introduces a real risk of self-deception – especially by those committed to our current system of trials and appeals or the reliability of specific types of expert opinion.

It is likely that fingerprint evidence will eventually be presented in a statistical form, probably as a likelihood ratio generated by one or more algorithms. When it does we will expect the algorithms to have been formally validated and to produce ‘outputs’ that are consistent with the known accuracy of the system (based on ground truth testing). That is, similar to the way DNA evidence is routinely presented. However, we do not have to wait for the perfection of future technologies before we require latent fingerprint examiners to present their opinions in a scientifically defensible form.¹⁷⁵ After a century of systematic exaggeration it is time for the state to present one of its most powerful forensic sciences in a manner that embodies the known abilities of examiners, and in a way that does not deprive defendants of the real possibility of error.

Categorical identification and infallibility claims are best left to the pre-scientific past. There are no principled legal reasons for not accepting mainstream scientific advice and requiring fingerprint examiners to present their undoubtedly expert opinions more modestly.

¹⁷⁴ In most cases testing includes the examiner, who is unavoidably implicated in the procedure – as in ACE-V.

¹⁷⁵ Some of these algorithms are in limited use. The US military, for example, has developed an algorithm that presents fingerprint evidence in a statistical form. Queensland Police have recently introduced an algorithm for identifying prints that are not questioned.